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BIOGEOCHEMICAL STUDY OF COPPER MINERALIZED ZONE NEAR KALYADI, KARNATAKA

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Abstract

Ultramafics intercalated with metasedimentaries in Kalyadi area host copper mineralization and the overburden of this mineralized zone has been studied from the point of geobotany and biogeochemistry. In the mineralized zone, the soil cover is very thin (1-1.5 ft), and supports sparse and stunted vegetation. Shrubs dominate the herbs and trees. Dodonaea viscosa, Cassia auriculata, Maytenus emerginata, Pavetta indica, Erythro xylon, Tecoma stans, Aerva lanata, Hyptis suaveolens, Atylosia albicans, Stachyterphyta indica, Chromolaena odarata are the plant species which have been studied and sampled. Morphologically, no significant changes could be made out from the species growing in the mineralized area. Depending upon the distribution and homogeneity of the plant species sampling has been carried out following a grid pattern. The elements analyzed for plant species and soil included Cu, Cr, Zn, Ni, Co, Mn and Mg. Trace element study of soil and floral species indicates moderate but inhomogenous dispersion of Cu from the bed rock source. Only a few samples of Leguminosae, Dodonaea viscosas, Erthyron xylon, Leucas ciliata and Pavetta indica showed slightly higher values. Thus, these species are considered as better up-takers of copper. Restricted Cr, Ni and Co in almost all the analyzed plants could be due to their lesser mobility. The overall biogeochemical observation has helped to recognize Leucas ciliata, Cassia auriculata and Erthyron xylon as species slightly favourable for Cu up-take and could serve as local indicators. Statchyterphyta indica is recognized as a good up-taker of Zn.

Keywords: Biogeochemistry, Geobotany, Copper mineralization, Kalyadi.

1. Introduction

Geobotanical and biogeochemical studies assume importance in mineral exploration programs. Compared to developed countries, very less work has been carried out in this field, in India. Numerous case studies on the application of biogeochemical prospecting have been reported from different parts of the world such as Russia, Australia, USA and Canada. Notable examples from southern Africa that have been reported include the flora growing over copper mineralization in the Zambian and Sheba Copper Belts (Brooks et al., 1992). Most of the work carried out in India pertains to characterizing concentration of elements in plants over limited mineralized areas. A study by Tiagi and Aery (1986) shows that several plant species, especially Talinum portulacifolium, growing in the Khetri Copper belt area are characterized by very high levels of copper. Another study by Veeranjaneyulu and Dhanaraju (1990) in Nallakonda copper deposit area reports the possibility of recognizing the plant Chrysopogon fulvus as the local indicator for copper owing to its high copper content accumulation (730 ppm) and high density of growth in the copper mineralized zone. Yet, recognizing the possible indicator species for the known deposits and their application is still in the preliminary stage. Though many copper mineralised areas are confined to mafic and ultramafic areas, their studies with a geobotanical and biogeochemical approach are relatively lesser. Some of the works have been reported by Brooks et al. (1992) and Brooks (1972). Most of the ultramafic substratums as reported by Brooks (1972) are poor in nutrients and thus do not support good vegetation growth. Brett et al.(1996), Ghaderian and Baker (2007), Lima et al.(1997), Proctor and Nagy (1992) and Reeves et al. (1996, 1999) also report biogeochemical constraints on exploration in mafic and ultramafic areas. Thus, there is a need to characterize the floral species for their metal uptake and also to characterize the soil/weathered substratum over mineralized bed rocks. Such studies are important in integrating different data to evolve new exploration strategies.

Plants growing on soils with high concentration of heavy metals normally contain higher elemental abundance in their tissues (Leavitt et al., 1979). As a result, a number of plants have been used for biogeochemical